

Amendments to the Claims:

This listing of claims replaces all prior versions and listings of claims in the application:

Listing of Claims:

1. (Currently Amended) A method of ~~designing/configuring a multivariate statistical monitoring an industrial process monitor by using~~ a partial least squares approach ~~comprises comprising:~~

constructing predictor and response matrices from reference data of the process ~~predictor and response matrices~~, the predictor matrix being comprised of signals of the manipulated and measured disturbance or cause variables of the process (predictor variables), and the response matrix being comprised of the controlled or effect variables of the process (response variables),

decomposing the predictor and response matrices into rank one component matrices, each of said component matrices being comprised of a vector product in which one vector (the score vector) describes the variation and the other (the loading vector) the contribution of the score vector to the predictor or response matrix,

decomposition being performed by ~~the creation of~~creating a parametric regression matrix based upon iterations of the decomposition of the predictor and response matrices,

~~characterised~~characterized by ~~the creation of~~creating a first ~~generalised~~generalized score vector which describes any significant variation of the process including variations of the predictor and response variables, and a second ~~generalised~~generalized score vector which represents the prediction error of the partial least squares model and residuals of the predictor matrix.

2. (Currently Amended) ~~A~~The method of ~~designing/configuring a multivariate process monitor as claimed in claim 1 in which~~wherein the ~~generalised~~generalized scores are calculated by constructing an augmented matrix, denoted here by Z and of the form $Z = [Y : X]$, where X is

the predictor matrix and Y is the response matrix, and constructing a score matrix $T_n^\circ = T_n^\circ - E_n^\circ$ in which T_n° and E_n° are generally of the form:

$$T_n^\circ = [Y : X][B_{PLS}^{(n)} : \mathfrak{I}]' R_n$$

$$E_n^\circ = [E_n : F_n][B_{PLS}^{(n)} : \mathfrak{I}]' R_n$$

the columns of the matrix T_n° providing the ~~generalised~~ generalized t-scores and the columns of the matrix E_n° the ~~generalised~~ generalized residual scores, where \mathfrak{I} denotes an MxM identity matrix, and $B_{PLS}^{(n)}$ is the PLS regression matrix.

3. (Currently Amended) ~~A multivariate statistical process monitor which has been designed/configured by the~~ The method of claim 1 and which is so arranged as to identify further comprising identifying abnormal process behavior, at least in part, by analyzing the residuals of the response variables.

4. (Previously Presented) A method of monitoring a process which comprises configuring a multivariate statistical process monitor by the method of claim 1, and identifying abnormal process behavior, at least in part, by analyzing the residuals of the response variables.

5. (Currently Amended) ~~A multivariate statistical process monitor which has been designed/configured by the~~ The method of claim 2 and which is so arranged as to identify further comprising identifying abnormal process behavior, at least in part, by analyzing the residuals of the response variables.

6. (Previously Presented) A method of monitoring a process which comprises configuring a multivariate statistical process monitor by the method of claim 2, and identifying abnormal process behavior, at least in part, by analyzing the residuals of the response variables.

7. (New) A method of monitoring an industrial process by a partial least squares model, comprising:

constructing a predictor matrix from reference data of a process being monitored, the predictor matrix comprising signals of predictor variables;

constructing a response matrix from the reference data of the process being monitored, the response matrix comprising signals of response variables; and

decomposing the predictor and response matrices into rank one component matrices by creating a parametric regression matrix based upon iterations of a decomposition of the predictor and response matrices, each of the rank one component matrices comprising a vector product in which a score vector describes a variation and a loading vector describes a contribution of the score vector to the predictor matrix or the response matrix, characterized by a first generalized score vector which describes any significant variation of the process including variations of the predictor and response variables, and a second generalized score vector which represents a prediction error of the partial least squares model and residuals of the predictor matrix.

8. (New) A system for monitoring a continuous multivariable process based on a partial least squares model for which more than two latent variables are retained, comprising no more than two statistical monitoring charts representing variation of predictor and response variables together with their residuals, to detect abnormal situations in the continuous multivariable process.

9. (New) The system of claim 8, wherein the two statistical monitoring charts comprise:
a T-squared monitoring chart representing variation of the predictor and response variables; and

a Q monitoring chart representing at least variation of residuals of the response variables.

10. (New) The system of claim 8, wherein the two statistical monitoring charts have a time base.

11. (New) The system of claim 8, wherein the response variables are not under closed-loop control with the predictor variables.

12. (New) The system of claim 8, wherein the multivariate statistical process monitoring system is operable to detect abnormal process behavior that affects mainly the response variables that are not under closed-loop control.

13. (New) The system of claim 8, wherein a first one of the two statistical monitoring charts is based on a first generalized score vector which describes any significant variation of the process including variations of predictor and response variables, and a second statistical monitoring chart is based on a second generalized score vector which represents a prediction error of the partial least squares model and residuals of a predictor matrix.

14. (New) An industrial process monitor comprising a multivariate statistical model of the process, the model having been configured by a partial least squares approach, wherein predictor and response matrices are constructed from reference data of the process, the predictor matrix being comprised of signals of the manipulated and measured disturbance or cause variables of the process (predictor variables), and the response matrix being comprised of the controlled or effect variables of the process (response variables), decomposing the predictor and response matrices into rank one component matrices, each of said component matrices being comprised of a vector product in which one vector (the score vector) describes the variation and the other (the loading vector) the contribution of the score vector to the predictor or response matrix, decomposition being performed by the creation of a parametric regression matrix based upon iterations of the decomposition of the predictor and response matrices, the model further

configured by the creation of a first generalized score vector which describes any significant variation of the process including variations of the predictor and response variables, and a second generalized score vector which represents the prediction error of the partial least squares model and residuals of the predictor matrix.

15. (New) An industrial process monitor as claimed in claim 4 wherein the generalized scores are calculated by constructing an augmented matrix, denoted here by Z and of the form $Z = [Y : X]$, where X is the predictor matrix and Y is the response matrix, and constructing a score matrix $T_n = T_n^\circ - E_n^\circ$ in which T_n° and E_n° are generally of the form:

$$T_n^\circ = [Y : X] [B_{PLS}^{(n)} : \mathfrak{I}]' R_n$$

$$E_n^\circ = [E_n : F_n] [B_{PLS}^{(n)} : \mathfrak{I}]' R_n$$

the columns of the matrix T_n° providing the generalized t-scores and the columns of the matrix E_n° the generalized residual scores, where \mathfrak{I} denotes an MxM identity matrix, and $B_{PLS}^{(n)}$ is the PLS regression matrix.

16. (New) An industrial process monitor as claimed in claim 14, which is arranged to identify abnormal process behavior, at least in part, by analyzing the residuals of the response variables.

17. (New) An industrial process monitor as claimed in claim 15, which is arranged to identify abnormal process behavior, at least in part, by analyzing the residuals of the response variables.